OUTBREAKS
INVESTIGATION & CONTROL

MODULE

NATIONAL INSTITUTE OF COMMUNICABLE DISEASES
(DIRECTORATE GENERAL OF HEALTH SERVICES)
22-SHAM NATH MARG, DELHI - 110 054

1998

OUTBREAKS INVESTIGATION & CONTROL

MODULE

Dr. Jotna Sokhey
Dr. Rajesh Bhatia
Dr. D. C. Jain
Dr. Jagvir Singh

NATIONAL INSTITUTE OF COMMUNICABLE DISEASES
(DIRECTORATE GENERAL OF HEALTH SERVICES)
22-SHAM NATH MARG, DELHI - 110 054

1998

This module is primarily for the purpose of training under the National Diseases Surveillance Programme. However, it can be used as guidelines for outbreak investigation.

CONTENTS

1. NEED FOR OUTBREAK INVESTIGATIONS

1.1. Many communicable diseases are endemic in India. An effective surveillance system is essential for planning, implementation and monitoring the disease control programmes. Many of these diseases have seasonal and cyclic trends which can be discerned through the surveillance system. These diseases can also cause outbreaks with the potential to spread rapidly and cause many deaths. Outbreaks of new and reemerging infections may also occur.

1.2. Precautionary measures taken in anticipation of an outbreak can prevent an acute public health emergency and save lives. While outbreaks cannot always be predicted or prevented, recognition of early warning signals, timely investigations and application of specific control measures can limit the spread of the outbreak and prevent deaths. Control measures are most effective when selective interventions are applied early.

1.3. The primary purpose of an outbreak investigation is to control the outbreak, limit its spread to other areas and assess how prevention strategies can be further strengthened to reduce or eliminate the risk of such outbreaks in the future.

2. PREPAREDNESS FOR OUTBREAK INVESTIGATIONS AND CONTROL

2.1. This document has been designed to help in making decisions regarding investigations, specific interventions and follow-up measures. While adaptations may be necessary at local levels depending on the field situations and available resources, it is important that preparatory action is taken so that the district is able to meet the eventualities if an outbreak occurs. Some of the recommended measures are given in the Box.

RECOMMENDED PREPARATORY ACTION
• Identify a nodal officer at the state and district levels. • Strengthen the routine surveillance system. • Constitute an inter-disciplinary team at state/district levels (rapid response team). • Train medical and other health personnel. • List the laboratories at regional /state/district level. • List 'high-risk' pockets in the rural / urban area. • Establish a rapid communication network. • Undertake IEC activities for community participation. • Ensure that essential supplies are available at the peripheral health facilities and buffer stocks are maintained at the district level. • Set-up an inter-departmental committee, including NGOs.

2.2. The identification of a nodal officer at the state and district levels is important for receiving information about unusual events and for ensuring that necessary follow-up action is taken in a timely and effective manner.

2.3. An inter-disciplinary expert team at state and district levels (rapid response team) comprising of epidemiologist or public health specialist, microbiologist, clinician(s), entomologist and concerned programme officer should be constituted and necessary administrative orders issued authorizing the team to move quickly to the site of the outbreak if such a request is made by the nodal officer. This is particularly important in the event of an unusual outbreak for which the services of the expert team may be required at short notice.

2.4. Concerned medical and health personnel should be trained in the principles of outbreak investigations including recognition of early warning signals, epidemiological and entomological parameters, differential diagnosis, laboratory support and specific control interventions.

2.5. Some laboratory tests are expected to be done at the PHC level; others may be available only at the district level. For some laboratory tests, samples may need to be sent to the state, regional or national levels. A list of the laboratories with full address, telephone and fax numbers along with the type of tests conducted is recommended to be maintained. The nodal officer should identify gaps in laboratory services at each level that can be filled within the given resources. Special emphasis must be placed on proper collection of clinical samples, their storage and transportation. A suggested checklist of services at district level is given at Annex 1.

2.6. An effective surveillance system must be established in each district. Data should be regularly analyzed as suggested in a separate module **"Surveillance of Epidemic Prone Diseases"** available from National Institute of Communicable Diseases (NICD), 22-Shamnath Marg, Delhi-110054; Phone:2521272, 2521060; FAX: 2922677; (E-mail:dir-nicd@x400.nicgw.nic.in, OR jotnas@del2.vsnl.net.in) Early warning signals will be missed in the absence of a reliable surveillance system.

2.7. It is important that adequate facilities are established at the district level for rapid and efficient analysis of the surveillance data. The nodal officer and other key personnel should receive training in the use of computers. Software such as EPI INFO are particularly useful in maintaining and analyzing line lists of cases of various diseases. Such analysis provides valuable epidemiological information regarding high risk groups, areas and factors.

2.8. In each district there are likely to be some areas which will be at a higher risk of outbreaks because of inadequate facilities such as water supply, poor sanitation, or some areas may have poor transportation and communication facilities which may impact negatively on early notification of an outbreak and health seeking behavior of the community. Spot maps of these areas may be prepared so that special attention could be given to the surveillance reports from these areas.

2.9. In the event of an outbreak, the state nodal officer is required to be notified immediately. The district officers may also need technical and other support in the event of an unusual outbreak or if the diagnosis is not confirmed. Since the National Institute of Communicable Diseases (NICD) is the nodal office at the national level, it is expected that notification of the outbreak would be made immediately to NICD, also indicating if any technical support is required. It is obvious that the communication network must be rapid in order to optimize its effectiveness. Under the national disease surveillance programme, it is expected that the district and state levels will be linked to NICD through e-mail and fax. Telephone facilities are expected at the PHC level.

2.10. The prevention and control of outbreaks require the close and active cooperation of the community. Community level IEC activities should be supported so that key messages regarding the control of the diseases and prevention of outbreaks are known. Health education material which has been prepared in advance and field tested will be useful if there is an outbreak in the area because such material may be required at short notice. The medical and health personnel should establish contact with community leaders and other key personnel in their areas which would be useful in receiving early warning signals and in soliciting community support during an outbreak. Local private practitioners could provide valuable support.

2.11. The nodal officer at the district level, in consultation with the concerned programme officers, must ensure that essential supplies are in place in the peripheral health facilities and that adequate buffer stocks are maintained at the district level. Inventories should be checked before the expected seasonal increase of cases. Some life saving medicines such as ORS packets may also be kept at the village level especially in the high risk pockets and areas which might become inaccessible during the monsoons.

2.12. It should be noted that during an outbreak a higher percentage of more severe cases may occur. Case fatality rate may increase due to certain factors such as high malnutrition rates in young children or

limited knowledge in the community about the danger signs of severe illness. Precautionary measures need to be taken and decided where and when to seek medical help in a timely manner. For example, post measles pneumonia kills many children. Mother must consult the health facilities whenever signs and symptoms of pneumonia appear for proper treatment of cases. It will only be possible if mothers know about signs and symptoms of pneumonia i.e. increased respiratory rate and chest indrawing.

2.13. When an outbreak occurs or when the risk of such outbreaks is high, the cooperation of other government departments, non-governmental agencies and the community often becomes necessary. Such help will be more forthcoming if mechanisms for interaction have been developed before the onset of an outbreak. It might be useful to convene a meeting of the concerned departments, community representatives and the NGOs before the expected seasonal increase in cases of diseases. Some mechanism for briefing the press should also be established. Some suggested areas in which the government departments and NGOs can assist may be seen at Annex 2.

2.14 Detailed demographic, environmental and cultural profile of district (including maps) should be available.

3. DISEASES REQUIRING INVESTIGATIONS

3.1. The diseases discussed in this document can broadly be classified into the four following groups:

- endemic diseases with the potential of causing focal or large outbreaks, e.g. malaria, cholera, measles, viral hepatitis, meningococcal meningitis etc.
- diseases for which eradication or elimination goals have been set. A single case of such diseases should be treated as an outbreak, e.g. poliomyelitis, guinea worm and yaws
- rare but internationally important diseases with high case fatality rates with the potential of importation due to conducive epidemiological conditions, e.g. yellow fever
- outbreaks of unknown aetiology

4. DEFINITION OF AN OUTBREAK

4.1. **An outbreak or epidemic is defined as the occurrence in a community of cases of an illness clearly in excess of expected numbers.** While an outbreak is usually limited to a small focal area, an epidemic covers larger geographic areas and has more than one focal point.

4.2 The number of cases which are needed to be called an outbreak varies according to several factors. It depends on past historical patterns of the disease, case fatality and complication rates, and potential of spread to other areas. For some diseases even a single case (acute poliomyelitis, guinea worm, unusual acute severe episode of an illness of unknown aetiology) constitutes an outbreak.

4.3 States and districts should establish criteria on the number of cases that constitute an epidemic based on their local situations. For example, 5 cases of similar illness of acute onset within an incubation period or one death in a village is being used as a criteria in one state to constitute an outbreak.

4.4 Increase in the total number of cases does not, however, necessarily indicate increase in the incidence of the disease. Variations in the number of reporting sites, completeness of reporting, geographical size of the catchment area and size of the population are factors that must be taken into consideration while analysing reports.

5. TRIGGER EVENTS (WARNING SIGNALS) FOR OUTBREAK INVESTIGATIONS

SUGGESTED TRIGGER EVENTS FOR OUTBREAK INVESTIGATIONS

- clustering of cases or deaths in time and/or space
- unusual increase in cases or deaths
- acute haemorrhagic fever
- severe dehydration following diarrohoea (usually with vomiting) in patients >5 years of age
- acute fever with altered sensorium
- acute fever with renal involvement
- acute flaccid paralysis in a child
- acute fever with painful lymphnode
- acute febrile severe illness of unknown aetiology
- occurrence of two or more epidemiologically linked cases of meningitis
- even a single case of measles or any other epidemic prone diseases from a tribal or other poorly accessible area
- unusual isolate
- shifting in age distribution of cases
- high vector density
- natural disasters

5.1. It is useful to have a short list of 'warning signals' which should trigger an investigation. If personnel at the local levels are alert about these signals and respond rapidly, it may be possible to arrest the outbreak in the early stages when control measures are most effective and can usually be undertaken within local resources.

5.2. An important purpose of a surveillance system is to prevent outbreaks or detect them in the early stage, and therefore the health personnel must be responsive to the warning signals. Some suggested trigger events are listed below in the Box.

6. INVESTIGATIONS AND ANALYSIS OF REPORTS

6.1 Verification of the Diagnosis

6.1.1 **The first step of outbreak investigation is to confirm the diagnosis of as many reported cases as possible**. Much time and effort may be wasted due to misdiagnosis. The reported cases should be investigated by a medical officer to confirm the diagnosis. The majority of the cases are expected to fall within the standard case definitions. In situations of doubt, whether an illness meets the case definition, a second opinion may be sought.

6.1.2 First reports about an outbreak will be based on clinical syndrome and diagnosis will be presumptive. Suggestions have been made for clinical syndromes, outbreaks of which are more commonly reported. Investigations must be made, including epidemiological, entomological and laboratory, to rule out the more common causes first. A thorough knowledge about clinical symptoms and epidemiological parameters is important for outbreak investigations.

6.1.3 Laboratory confirmation of clinically-diagnosed cases or identification of the etiological agent may sometimes be necessary. Under such a situation, samples should be collected carefully from a few selected cases. It is not necessary to collect specimen from all cases as it is not essential for the outcome of outbreak investigations and control measures. Collection of unnecessary samples is discouraged as it places a heavy load on the laboratory and some tests are very expensive. The types of tests, sample collection and transportation procedures have been detailed in a separate module.

It is not necessary to collect specimen from all cases as it is not essential for the outcome of outbreak investigations and control measures. Collection of unnecessary samples is discouraged as it places a heavy load on the laboratory and some tests are very expensive.

6.1.4 If the outbreak is unusual, case fatality rates are very high, aetiology cannot be determined or if the clinical syndrome had not been reported in the area before, the state officer and NICD would be expected to assist the district authorities in investigations.

6.2 *Epidemiological Features and Standard Case Definitions*

6.2.1. It is necessary to know the clinical and epidemiological features of the diseases to effectively investigate and control outbreaks. For easy reference, the epidemiological parameters should be available in tabular form.

6.2.2. Differential diagnosis of some of the important and common clinical syndromes have been given in this document. Medical officers are encouraged to expand the list and include other conditions prevalent in their areas.

6.2.3. Standard case definitions are summarised in a separate module **"Case Definitions of Epidemic Prone Diseases"** available from NICD.

6.3 *Criteria for Investigating an Outbreak*

6.3.1. Oubreaks should be seen as excellent opportunities to analyse why they occur, identify high risk areas and groups, and evaluate control measures. Efforts therefore, should be made to investigate all the outbreaks as well as threatened oubreaks.

6.3.2. After an outbreak has been confirmed, specific interventions will depend on the cause of the outbreak and mode of transmission. Timely treatment and follow-up of cases and contacts is important to reduce mortality.

6.4 *Case-Finding Through Active Surveillance and Community Surveys*

6.4.1. After establishing the existence of an outbreak and verifying the diagnosis, it becomes important to accurately define and count the cases. During the period of the outbreak, all the cases of the disease under consideration occurring in that area should be identified and listed.

6.4.2. Active surveillance is active search for cases. This may include visits or telephone calls to the medical facilities or private practitioners that might expect to admit or attend cases of the disease. Active surveillance through peripheral health personnel, personnel from other government departments, NGOs and key community representatives provides additional information about cases who may not have been seen at government health facilities. Valuable information can be obtained by contacting key community representatives, especially if the outbreak is focal. Such information is useful in defining the extent of the outbreak.

6.4.3. Active surveillance should be maintained until the outbreak is over (usually it is when the double incubation period has elapsed after the last case). Developing a regular schedule of daily or weekly visits (depending on the urgency of the situation) or telephone calls to concerned institutions or individuals will help maintain the flow of surveillance information to those analysing the outbreak and directing control activities.

6.4.4. Suspect case definition may be used to identify cases. While it is recognised that there may be some over-reporting of cases, it is nonetheless important that no case is missed, especially if treatment is available. Some of the epidemic prone diseases are amenable to simple and cost effective treatment and case fatality rates are usually less than 1% if such treatment is applied early during the course of the illness (for example, in cholera). In the absence of specific treatment, mortality rates can be very high.

6.4.5. Depending on the disease and the resources available to investigate the outbreak, it may even be desirable to conduct house-to-house visits, especially in the homes of contacts of cases. In some circumstances, community assistance may be enlisted for house-to-house visits.

6.4.6. Completeness of reporting and relevant information on majority of cases are important for determining high risk factors, complications and mortality rates and health seeking behaviour as well as to further understand the clinical pattern and epidemiology of the disease. The information is also necessary to assess the quality of the national programmes (if relevant).

6.5 Line-Listing, Defining and Counting of Cases

6.5.1. It is important that information from surveillance be recorded in a standardised manner. Persons who are ill and meet the case definition for the outbreak disease should be entered onto what is called a "line-listing". This is a list of all reported cases with the relevant data on each case which provides the basis for counting of cases. It is the data-base on which the descriptive epidemiology of the outbreak can be made and it can serve as the basis for other, more sophisticated, analytical epidemiological studies, such as risk-factor analysis, vaccine efficacy, etc. The line list suggested for field use is shown in Annex-3.

6.6 Description of Outbreak

In investigating an outbreak, it is necessary to provide a detailed description of outbreaks in terms of time, place and person.

6.6.1. Distribution by time

The onset of illness of the cases should be graphed by hours (for example, in food poisoning), days, weeks or months, as appropriate. This type of graph is commonly referred to as an epidemic curve. The epidemic curve can be helpful in identifying the index (first) case or cases, and may even suggest patterns or modes of transmission. During outbreaks, analysis of cases by time will help to document the trend of the epidemic and to monitor the effectiveness of the containment measures.

In case of endemic diseases, it is also useful to present previous data on a line graph. Such graphs help to demonstrate the magnitude of the outbreak compared to the previous reported incidence, rapidity of spread of the disease and evaluation of control efforts.

6.6.2. Distribution by place

A map of the area or even a rough sketch can be drawn showing where each reported case resides to indicate geographical distribution of cases and to identify high risk pockets. In some situations, serial spot maps, by week or by month (or by disease generation) may provide insight into the pattern of the spread of the disease over time.

Cases tend to cluster, and it may also be useful to mark affected schools or other institutions on the map in addition to residential locations. Such mappings may assist in identifying the sources of infection.

6.6.3. Distribution by person

Cases should be described in terms of age, sex, occupation, socio-economic parameters, migration, vaccination history and other relevant characteristics.

It is usually sufficient to group cases by age-groups by 0-11 months, 1-4 years, 5-14 years, 15-44 years and $\geq$ 45 years. However, in the case of vaccine preventable disease outbreaks which usually affect young children, grouping with smaller intervals will be needed such as <1 year, 12-23 months, 24-59 months, 5-9 years, 10-14 years and $\geq$ 15 years.

While preparing tables, the population characteristics, for example related to age and sex, should be grouped accordingly. While

calculating the age-specific attack, complication or mortality rates, the proportion of the age group under study to total population should be taken into account while calculating rates.

6.7. Description of environmental conditions

The study of environmental conditions and the dynamics of its interaction with the population and causative agents will help in the formulation of hypothesis on genesis of the epidemic, which will make the basis for the control measures to be taken. With respect to physical environment, the data on rainfall, humidity and temperature are available in the district meteorological centres. Information on natural disasters like floods, cyclone, drought, earth quake etc., as available may be utilised for the description of the epidemic. Man made situation like developmental projects on irrigation and industries may create environmental conditions conducive for disease transmission. Similarly information on drinking water supply and environmental sanitation is crucial for the investigation.

6.8. Additional steps during investigation of outbreaks of vaccine preventable diseases

6.8.1. The determination of Immunization coverage levels is crucial if the outbreak is due to a vaccine preventable disease. The Immunization status in the community can be assessed through Immunization performance records available at the PHC. Percentage Immunization coverage is estimated by dividing the total number of doses (measles and BCG) or third doses (OPV and DPT) of the vaccine administered to a specific age-group by the total population of that age-group in the affected village(s) or urban area. The data may be summarised for example for OPV as shown below.

Reported vaccination coverage for OPV

Year	Population	Estimated No. of infants	Vaccination performance					Percent coverage*
			0 dose	1 dose	2 doses	3 doses	Booster	

* Percent coverage = No. given 3 doses x 100 / Estimated number of infants

6.8.2. The age-groups vaccinated should be fully assessed as inclusion of older children may give a false sense of higher coverage. The immunization activities, including periodicity of the immunization

sessions, quantities of vaccines received and cold chain system, should be reviewed.

6.8.3. Information on immunization coverage may also be available through past vaccination coverage evaluation surveys. If no such coverage evaluation survey has been performed recently, or if estimates of immunization coverage by reports of doses administered are unavailable or suspect, (a large number of vaccinations may be given by the private sector and are not reported) then it may be useful to conduct a coverage evaluation survey as a part of the outbreak investigation which may also be used to estimate vaccine effectiveness.

6.8.4. Immunization status is an important descriptive as well as analytical parameter. The immunization status of each case must be carefully investigated to ascertain the number of doses of the vaccine received by the patient. Immunization cards or immunization registers should be checked to verify the immunization status. Verbal history should be used only if such records cannot be obtained. Ideally, the place of immunization should also be examined to assess quality of the cold chain.

6.9. Laboratory investigations

6.9.1. The results of laboratory investigations should be included in the outbreak investigation report. Results of some tests can be obtained locally and quickly. Such tests include water quality monitoring if a water-borne disease is suspected.

6.9.2. Control activities and treatment of patients should not be delayed pending laboratory confirmation of diagnosis. Action should be initiated based on clinical, epidemiological and entomological findings.

6.9.3. Special emphasis must be placed on proper collection, labelling transportation and storage of clinical samples.

6.9.4 It is not necessary while submitting the preliminary report to wait for the results of laboratory tests which have been sent to laboratories outside the district and which may take sometime. The results can be added in the final report.

6.9.5 During the course of investigations, universal infection control precautions are expected to be implemented. While investigating outbreaks of haemorrahagic fever or if parenteral route of transmission is suspected, protective gear such as gloves, masks etc. are expected to be worn by health personnel treating or investigating patients. Procedures that require the collection of blood and other clinical samples should be undertaken carefully.

6.10. Entomological investigations

6.10.1. Entomological investigations are an important aspect of field investigations as a number of outbreaks are vector borne. Entomological investigations are useful to confirm or rule out the probable cause of the outbreak, especially if results of laboratory tests are not available.

6.10.2. High vector density is a reflection of the unsatisfactory field implementation and monitoring of vector control measures. High vector density is a warning signal as the risk of vector borne outbreaks increases under such conditions. On the other hand, the risk is low if the density is maintained below critical levels.

6.10.3. If dengue fever/ dengue haemorrahagic fever is suspected or confirmed, vector surveillance and vector control activities should be taken up with high priority. Vector surveillance should be immediately undertaken in other high risk pockets even if no case has been reported from the area.

6.11. Determining Who is at Risk of Disease

6.11.1. The descriptive epidemiology will help to define the population groups at high risk of disease in terms of age-groups, geographical location, activity etc., immunisation status and other characteristics.

6.11.2. It is more appropriate to determine attack rates rather than absolute numbers because rates take into account the variations in the population size of different groups. Such rates are generally computed by dividing the number of cases in a population group by the population size of the same group.

Example: There are 45 cases of measles among 1100 children less than 5 years of age and 52 cases in 3400 children 5-14 years of age in the affected town.

Attack rate = 45/1100 = 0.04 or 40 cases per 1 000 population less than 5 years of age

Attack rate = 52/3400 = 0.015 or 15 cases per 1 000 population 5-14 years of age

6.12. Follow-up Visits

6.12.1. Follow-up visits to the community and health facilities are important during the declining phase of the outbreak to (i) not to miss

last cases, (ii) detect and treat later complications, for example, in measles (iii) evaluate the control strategy and (iv) complete the documentation of the outbreak.

6.12.2. The frequency and duration of follow-up visits will depend on many factors and decisions will have to be taken at the local level. The factors that will influence decision will be the severity of the disease, its potential for spread to other areas, maximum incubation period and the accessibility of the affected area to routine health services.

6.13. Documentation

6.13.1. Documentation of the epidemic is an important step in outbreak investigation. Useful lessons can be learnt if the documentation is complete and data properly analysed. The information will be useful in drawing up long term strategies for reducing the risk of the outbreaks in future and in more effective handling of the outbreak if it were to occur. A suggested format for final report is given in at Annex-4.

6.13.2. It is also important that the report is shared with the concerned officers of other states and districts.

6.13.3. Publication of the report in a technical journal or newsletter will ensure wider accessibility to the information.

6.13.4. The main findings of the outbreak should also be discussed with the members of the rapid response team and the members of the inter-departmental committee.

7. HEALTH EDUCATION

7.1. Health education and public awareness and co-operation are important to control an outbreak. If the community knows how the outbreak spreads and what measures they can take in their own families, the risks can be considerably reduced. It is also important that the public should know if treatment is available and where to seek medical help. If such information is available there is less likely to be panic and chaos, and community support will also be forthcoming. While the key messages will essentially remain the same for all areas, the language and style may need to be adapted to local needs.

7.2. It is suggested that action for preparation of health education material and key messages is taken for epidemic prone diseases. Some suggestions to develop the key messages are given in the documents on specific diseases.

7.3. It is particularly important to inform the public that most cases of epidemic prone diseases can be managed if treatment is started at the earliest.

7.4. It is also important that the public and administrators are aware of inappropriate measures so that much time and resources are not diverted for measures which are ineffective. These include vaccination and chemoprophylaxis for cholera and quarantine measures for most infections.

8. PREVENTION AND CONTROL OF AN OUTBREAK

8.1. Water borne outbreaks

8.1.1. The risk of outbreaks of water-borne diseases such as cholera, acute watery diarrhoea, viral hepatitis, shigellosis and typhoid fever can be minimized and an outbreak can be prevented from spreading further by taking following measures:

- provision of safe water
- adopting safe practices in food handling
- frequent handwashing
- sanitary disposal of human waste

8.1.2. The above steps are required both as long-term measures to prevent cholera and other water borne diseases as well as measures to be taken in a focal area where an outbreak is anticipated. Community participation for safe practices with regard to storing water and food handling are essential to prevent outbreaks.

INEFFECTIVE MEASURES FOR CHOLERA

- chemoprophylaxis
- vaccination against cholera
- travel and trade restrictions (*cordon sanitaire*)

8.1.3. Mass chemoprophylaxis is not only ineffective in preventing the spread of the disease, but it also diverts manpower and resources from effective measures. In several countries, it has contributed to the emergence of antibiotic resistance, depriving severely ill patients from a valuable treatment. The value of selective chemotherapy of household contacts is also doubtful. It is not recommended as a routine measure.

8.1.4. Vaccines that are currently available against cholera do not have high vaccine efficacy rates. In those who are immunized with two doses, protection lasts for 3-6 months only. Vaccination does not reduce the incidence of asymptomatic infections or prevent the spread

of infection. Vaccination campaigns divert resources and manpower from more useful control activities. ***No country requires travelers to have a cholera vaccination certificate.***

8.1.5. Travel and trade restrictions between countries or different areas within a country do not prevent the spread of cholera. Majority of the infected individuals have no symptoms. Setting up check-posts requires massive inputs and diverts attention from other more useful control measures.

8.1.6. An important objective of outbreak investigations is to reduce mortality rates by early diagnosis and appropriate treatment. Case fatality rates can be significantly reduced through effective Oral Re-hydration **(ORT)** therapy.

8.2 Vector borne outbreaks

8.2.1. Vector control measures should be applied as per the calendar of activities to optimize impact for prevention of outbreaks. The control measures should be directed towards all stages of the life cycle of the vector.

8.2.2. The risk of vector borne diseases has increased in the urban and peri-urban areas due to the changing life styles and industrial activities which have made the surrounding environment more conducive for the breeding of mosquitoes and other vectors.

8.2.3. The *Aedes* mosquito (vector for dengue fever) is a domestic breeder preferring clean water containers. The cooperation of the community is imperative to control mosquito breeding by taking simple precautionary measures. Regular monitoring is essential to ensure that breeding sites are eliminated in a timely manner.

8.2.4. The risk of some vector borne outbreaks increases in the presence of animals or birds. For examples, pigs are considered to be amplifying hosts of Japanese Encephalitis virus. Where piggeries have been established, regular monitoring and periodic anti-vector measures are indicated. The local pradhan and panchayat members should be aware that if there is an acute case of fever with altered sensorium, the local health authorities should be notified immediately.

8.2.5. Bubonic plague and visceral leishmaniasis are other important vector borne diseases. In areas where leishmaniasis is prevalent or there is a potential threat of leishmaniasis or plague, vector monitoring and IEC activities are recommended.

8.3 Food-borne outbreaks

8.3.1 Food-borne diseases include food poisoning due to toxins produced by micro-organisms (e.g. *Staphylococcus aureus*) and chemicals, as well as food-borne infections (e.g. Salmonella infection). In fact, all the waterborne infections (viral, bacterial and parasitic) can be transmitted through contamination of food. Food-borne outbreaks are very common in our country. Whereas in the past contaminated food processed in the home exposed a few individuals, the food processed and distributed extensively by the industry could result in the exposure of a large number of people.

8.3.2 While investigating an outbreak of food-borne infection, efforts should be made to interview all who are exposed for history of food consumption and illness, if any. Rates of illness in those who did or did not consume a specific food item are compared, and relative risk is calculated for each food item. The implicated food would give the highest attack rates, and/or the highest relative risk. In large outbreaks, a sample of population may be interviewed, or the investigations may be by case control studies. Food handlers and suspected food also need attention during investigations.

8.4 Air-borne outbreaks

The important air-borne diseases those can cause outbreaks are measles, diphtheria, whooping cough, chickenpox, meningococcal meningitis, and influenza. The first three diseases are vaccine preventable and their outbreaks reflect poor immunisation activity in the community. For influenza and chickenpox, no vaccine is currently available in India and in absence of specific therapy, control of their outbreaks is a difficult proposition. Chickenpox in higher age group is often serious and large number of patients need to be admitted in health facility, particularly Infectious Diseases Hospitals. In case of meningococcal meningitis, though a bivalent vaccine is available, it is not routinely used. In outbreak of meningococcal meningitis, vaccination of selected high risk groups only is recommended. Since specific and effective treatment of this disease is available, early diagnosis and initiation of specific treatment can cut down the mortality substantially.

The general principles of control of outbreaks of air-borne diseases are: respiratory hygiene, avoidance of over-crowding, maintenance of good ventilation, IEC for early recognition, chemoprophylaxis (for meningococcal meningitis) and immunisation (for vaccine preventable diseases).

8.5 Parenterally transmitted infections

Injections can transmit a variety of infections including HIV and hepatitis B and C. Inadequately sterilised needles and syringes, sharp instruments that penetrate the skin, and unscreened blood are common source of parenterally transmitted infections. Appropriate sterilisation of needles (boiling for at least 20 minutes) and screening of all blood donations for HBsAg, HIV, VDRL and malarial parasites will go a long way in preventing these infections.

9. PRECAUTIONARY ACTION IN HIGH RISK POCKETS TO WHICH THE OUTBREAK CAN POTENTIALLY SPREAD

Following actions are suggested:

9.1. Alert health personnel and hospitals to report increase or clustering of cases or deaths. All health facilities should maintain records of patients seen, including in OPD. Address of the patients should be recorded. If there is a sudden increase in cases or clustering of cases in an area, field investigations should be carried out and necessary corrective action taken. An effective surveillance system can provide an early warning signal and prevent outbreaks.

9.2. Ensure that the health personnel are adequately trained and that the recommended guidelines are followed in the hospitals. If necessary, orientation sessions or retraining may be organized. Early and appropriate treatment can save many lives.

9.3. Arrange random checks for water quality for coliform organisms (faecal contamination). Special attention may be given to high risk pockets. In places where water is found to be of unsatisfactory quality, follow-up action may be taken with the concerned authorities for water supply. If feasible, chlorination should be carried out to render water safe for drinking.

9.4. Health educational activities should be carried out in the community to promote safe practices especially before the monsoons when the seasonal increase of cases of water and vector borne diseases can be expected.

9.5. Check that adequate stocks of essential supplies are available and have been distributed to the peripheral health institutions well in advance of the expected seasonal increase of cases, for example, ORS packets should be available in all the health facilities. It is recommended that adequate stocks of bleaching powder, chlorine tablets, intravenous fluids, appropriate antibiotics and insecticides are available in case of an emergency.

10. SYNDROMIC PRESENTATION OF DISEASES

10.1. Common syndromes

The monitoring of early warning signals and first reports will be syndromic and diagnosis will be presumptive. These may include acute cases of:

- fever
- haemorrahagic fever
- fever with altered sensorium
- diarrhoeal diseases
- jaundice
- flaccid paralysis
- severe illness of unknown aetiology.

10.2. Acute cases of fever

10.2.1. Clustering and sudden increase of acute cases of fever may be due to malaria, dengue fever or other viral fevers. If the increase meets the criteria of an outbreak, necessary clinical, epidemiological, laboratory and entomological investigations must be conducted to confirm diagnosis.

10.2.2. Fever with rash may be due to measles or chicken pox. Diagnosis can be confirmed by typical clinical presentation, age group affected and vaccination history (measles).

10.2.3. Acute fever are caused by a variety of viruses. The type of virus can be identified only by laboratory tests. However, the type of clinical presentation and other epidemiological and entomological parameters may help in presumptive diagnosis. Some of the diseases such as dengue fever may present in severe form such as haemorrahagic fever and shock syndrome. The report of even a single case of haemorrahagic fever from an area which has a reported increase of acute fever cases compatible with dengue fever as well as a high density of *Aedes aegypti* is a strong indication in favour of dengue fever.

10.2.4. Malaria is relatively common in our country. Any increase in cases of acute fever from an area which has other conditions conducive for the spread of malaria, requires that malaria is considered as the cause of the outbreak.

10.2.5. Increase in the acute fever cases may be due to typhoid fever which is also relatively common in many parts of the country. Patients

should be examined to see if the clinical presentation is compatible with the case definition of typhoid fever.

10.3. Haemorrhagic fever

10.3.1 Cases of haemorrahagic fever are expected to be relatively rare and few in number. It is therefore very important that notification by the clinicians is made immediately by the fastest means of communications. Investigation of the case of haemorrahagic fever may identify a dengue fever outbreak. If a clustering of acute fever cases have been reported and dengue fever is suspected on clinical grounds and entomological investigations, a reported case of haemorrahagic fever from the area will clinch diagnosis.

10.3.2. Haemorrhagic fever can also be caused by chikungunya virus. The disease is clinically indistinguishable from dengue fever. However, cases of shock syndrome have not been reported and case fatality rates are low.

10.3.3. Severe forms of haemorrahagic fever with high case fatality rates due to yellow fever and ebola fever have been reported from some countries. There has been no report from India. Due to rapid means of transport and increase in the number of travellers, there is a potential risk of importation of these infections. Travel history or close contact with those who have recently traveled abroad should be obtained if the above infections are suspected. **State and national authorities must be notified immediately by the fastest routes of communication.** Infection control precautions must be practiced while investigating or treating patients, and handling infectious biological material.

10.4. Fever with altered sensorium

10.4.1. JE infection is usually mild with no overt clinical symptoms or mild fever with headache. However, the patient may present with signs of encephalopathy. Usually not more than a few such cases (1-2) occur in one village. These patients will give a history of acute onset with fever and change in behavior or sensorium lasting for more than 24 hours. Focal neurological deficits may or may not be present. Disturbances of sensorium are reflected as lethargy, somnolence, irritability, apathy or loss of consciousness. The patient may develop difficulty of speech and other neurological deficits like ocular palsies, hemiplegia, tremor and ataxia. There may also be loss of bladder and bowel control. The focal neurological signs may be stationary or progressive. In majority of the cases, individuals develop immunity after infection. In endemic areas cases are, therefore, seen more often in children under 15 years of age as the adult population is already immune through natural infection. In virgin areas, cases may be seen in all age groups. Patient should be

hospitalized immediately to reduce mortality rates. Cases are confirmed by serology for JE antibodies (demonstratin of IgM antibodies or four fold rise in IgG antibodies in paired serum samples). Isolation of virus from CSF or brain tissue is not routinely done.

10.4.2. A case of meningitis usually presents with sudden onset of high grade fever, severe headache, stiff neck with or without altered sensorium. Presence of nuchal rigidity and positive Kerning and Brudzinski signs confirm the clinical diagnosis. Meningitis may occur due to tubercular, viral or pyogenic organisms. A lumber puncture for demonstration and/or isolation of organisms from CSF is essential. A commercially available latex agglutination test may provide the aetiology of some agents of meningitis i.e. *Streptococcus pneumoniae, Haemophilus influenzae B, Meningococci A&C.* It is noteworthy that meningococcal meningitis may occur in epidemic form.

10.4.3. One of the complications of malaria caused by *P.falciparum* is encephalopathy. Since malaria is relatively common, the diagnosis of malaria should be first considered. The diagnosis is confirmed if field investigations indicate malariogenic conditions, illness is clinically compatible and anti-malaria treatment is effective. The facilities for making blood slides and examining them should be available at each PHC.

10.4.4. Typhoid fever is usually characterized by gradual onset of malaise, lethargy, headache, myalgia, loss of appetite and fever that increases in stepwise fashion to reach 39-41° C in 5-7 days period. A mental apathy and dullness is common and delirium may develop. At this stage patient may present as fever with altered sensorium. Since typhoid fever is very common in our country, it should always be excluded by careful history, physical examination and blood culture for *S.typhi.*

10.4.5. Fever with altered sensorium (encephalopathy) may occur as a result of complication of some diseases such as malaria, dengue fever, measles and pertussis. Such complications occur in a relatively small proportion of the cases. Even a single case of encephalopathy therefore reflects a relatively large number of cases of the disease in the community. It is probable that clustering of cases of acute fever have already been documented through the routine surveillance system and report of a rare but well recognized and documented complicated case further confirms the cause of the outbreak. It is important that the clinicians are aware of the need to report such cases immediately so that further field investigations could be carried out.

10.4.6. Tuberculous meningitis is relatively common in many parts of our country. Although large number of cases are reported, TB

meningitis is not expected to occur in the form of explosive outbreaks. Clinicians must, however, keep in mind TB meningitis as a differential diagnosis, especially if the patient is a young child.

10.4.7. If any case of encephalopathy due to unknown aetiology occurs in an area not known for JE, it should be reported immediately to the state health authorities for appropriate investigations. Since samples for virus isolation need special handling, it is appropriate that specialised institutions such as NICD and NIV are also involved in the investigations in the early stages.

10.5. Acute cases of diarrhoeal diseases

10.5.1. Water borne and food borne diseases can present with a variety of clinical symptoms. Acute watery diarrhoea in young children is the most common problem. Cases occur throughout the year, with a seasonal increase in the monsoon and post-monsoon months. Focal outbreaks of acute watery diarrhoea can occur. Such outbreaks have also been reported following outbreaks of measles. Prompt action is important to check the spread of the outbreak and to provide oral rehydration therapy which is life saving. In the absence of ORT, high mortality rates have been recorded. Death may occur within a few hours of severe episodes of acute watery diarrhoea. The younger the age group, the more susceptible they are to dehydration.

10.5.2. While diarrhoeal episodes may also occur in adults, these usually do not result in severe dehydration or death. If cases of severe dehydration or death following acute watery diarrhoea is reported in patients older than 5 years of age, cholera should be suspected and control measures at the field level should be initiated as per guidelines.

10.5.3. Outbreaks of dysentery can occur in children. Such outbreaks have the potential of causing a large number of deaths unless specific treatment is initiated in a timely manner. It is important that the community and the peripheral health personnel are aware of the danger sign of blood in the stools (bloody diarrhoea) so that medical help is sought immediately.

SYNDROMIC PRESENTATION OF DISEASES

Acute fever

malaria
dengue fever
measles
influenza
other viral infections
plague
typhoid fever

Haemorrhagic Fever

dengue haemorrahagic fever
leptospirosis
chikungunya fever
yellow fever, ebola, hanta, lassa fever (potentially importable infections) **

Acute Fever with Altered Sensorium

falciparum malaria
japanese encephalitis
meningococcal meningitis
other meningitis (pyogenic, viral)
post measles encephalopathy *
pertussis encephalopathy *

Acute Diarrhoeal Diseases

acute watery diarrhoea in young children
acute watery diarrhoea in patients above 5 years of age with severe dehydration (suspected cholera)
dysentery (bloody diarrhoea)

Acute Respiratory infections (Acute pneumonia)

influenza
leptospirosis
plague
anthrax
melioidosis
hanta virus

Jaundice

hepatitis E
hepatitis B & C (if focal with high case fatality rate) *
leptospirosis
yellow fever (potentially importable) **

Acute Flaccid Paralysis

poliomyelitis

Severe Illness of Unknown Aetiology

* - relatively rare and cases may be few in number

** - not reported in India. If diagnosis is suspected, travel history and close contact with those who have recently traveled abroad should be obtained.

10.6 Acute Respiratory Infections (Acute pneumonias)

10.6.1. Acute respiratory infections leading to pneumonia are major causes of morbidity and mortality in India, especially in early childhood. They can be caused by a variety of microorganisms including bacteria, viruses, fungi and parasites. Most of the pneumonias present as sporadic cases.

10.6.2. Some diseases like plague, anthrax, leptospirosis, influenza, melioidosis and hanta virus infection may result in severe outbreaks with mainly pulmonary involvement. These may affect people from all age groups. Even if a clustering of a few cases in older children and adults is noticed, investigation should be initiated promptly for impending outbreaks of these infections so that appropriate action for treatment of cases and control of outbreak is promptly taken.

10.6.3. Patients with acute pneumonia usually present with acute fever, chills, cough, chest pain, other non specific symptoms, varying degree of respiratory insufficiency, and infiltrate on chest X-ray. In addition, there may be haemoptysis and leukocytosis or leukopenia. Once pneumonia is suspected, the specific etiologic diagnosis is necessary for proper management to prevent mortality and reduce further transmission.

10.7. Jaundice

10.7.1. Although jaundice may occur due to many reasons, viral hepatitis is responsible for the majority of cases with jaundice in our country. At least 6 agents (HAV, HBV, HCV, HDV, HEV and HGV) can cause viral hepatitis.

10.7.2. Feco-orally transmitted hepatitis E virus has been responsible for virtually all the outbreaks of viral hepatitis in India. These outbreaks are invariably linked to contamination of water supply. The expression of icterus appears to increase with increasing age. There is no evidence of a chronic form. A majority of Hepatitis E cases however, occur in young adults. Secondary household cases during the outbreaks are uncommon. The case fatality rate may reach up to 20% among those infected during the 3rd trimester of pregnancy.

10.7.3. Recently, outbreaks of hepatitis B occurred in defined rural communities of Gujarat, Haryana and Rajasthan states which were epidemiologically linked to the use of unsafe injections by unqualified medical practitioners. The outbreaks were marked by high case fatality rates.

10.7.4. Acute viral hepatitis is such a sufficiently distinct clinical syndrome that it usually poses no difficulty in diagnosis. Patient develops nonspecific symptoms including malaise, weakness, anorexia, nausea, vomiting, fever, and mild pain in abdomen. Soon, jaundice and dark urine follow. The duration of jaundice is variable, but usually lasts 1-3 weeks. These is dramatic elevation of ALT and AST (≥8 times of normal), and mild elevation of alkaline phosphates (usually only 3 times of normal). However, specific types of viral hepatitis in individual patients can't be distinguished on clinical grounds. The diagnosis is done by serology.

10.7.5. Leptospirosis is emerging as an important cause of jaundice in many parts of country. The disease is usually characterized by abrupt onset of high grade fever, myalgia and conjuctivial suffusion. Rash is occasionally present. If patient present with jaundice, renal involvement and hemorrhage, leptospirosis should be strongly suspected. Meningitis, pulmonary and cardiac involvement may also be present in some cases. Unless treated promptly with antibiotics, it is marked by high case fatality rates. The diagnosis is confirmed by demonstration of rising antibodies, or isolation of leptospires from blood during acute illness and from urine after the first week.

10.8. Acute Flaccid Paralysis

10.8.1. Poliovirus infection is the most important cause of acute flaccid paralysis (AFP) in children. The possibility of polio should be considered for any case of AFP, even in areas with high OPV coverage levels and a very low incidence of poliomyelitis. The diagnosis of paralytic poliomyelitis should be discarded only after another diagnosis has been established.

10.8.2. Acute paralytic poliomyelitis is characterized by fever followed by abrupt onset of weakness or paralysis of limbs which does not progress after first 3 days. Paralysis is not present at birth and is not associated with serious injury or mental retardation. Typical findings on physical examination include: acute flaccid paralysis, muscle tenderness, no sensory loss, absent or depressed deep tendon reflexes, and asymmetrical findings. Wasting of affected muscle is a late finding. Residual paralysis after 60 days of onset of symptoms, or death or unknown follow-up in an AFP case makes the presumptive diagnosis. Isolation of wild poliovirus from AFP cases or contacts confirm the diagnosis of acute poliomyelitis.

10.8.3. Paralytic poliomyelitis is most often confused with Guillain-Barre syndrome (GBS), transverse myelitis, and traumatic paralysis due to sciatic nerve injury. Traumatic paralysis due to sciatic nerve injury following a misplaced glutcal injection can be differentiated by a careful

history and physical examination. Fever is usually absent in GBS and the paralysis is symmetrical and distal. There are global hypotonia and global absence of deep tendon reflexes. Cramps, tingling sensation, and hypo-anesthesia of palms and soles are usually present in GBS. Many cases of polio have initially been diagnosed as GBS even by experts. Accordingly, WHO recommends that stool specimens should be tested for poliovirus on all cases of GBS less than 5 years of age.

Exercise 1

Koraput district was reported to be affected by an "outbreak" of acute gastroenteritis (GE) in July-August, 1991. About 2270 cases and 413 deaths occurred during this period. Most of the cases had only diarrhoea and vomiting.

Q.No.1.1. How will you decide whether or not the district was in the grip of an outbreak?

Table-1.1 describes the reported data on GE from the Koraput district during 1988-1991.

Table 1.1
Cases and Deaths due to GE in district Koraput, 1988-91

Year	No. of cases	No. of deaths
1988	981	225
1989	375	112
1990	1387	173
1991 (upto August)	2380	426

Q.No.1.2. Now, will you consider it an outbreak of GE? If yes, why? If not, why?

Analysis of the age distribution of 308 deaths revealed that about 9% of deaths occurred in children below five years of age and about 62% of deaths occurred in adults above 20 years of age.

Q.No.1.3. Does it help you in suspecting cholera as the cause of this outbreak?

Q.No.1.4. What was the most disturbing features in this outbreak? Was it preventable?

Rectal swabs from 59 cases were examined in the laboratories of NICD, Delhi. 15 samples were positive for *V.cholerae* O1 biotype El Tor. The isolates were sensitive to tetracycline, nalidixic acid, ampilcillin and chloramphenicol, but resistant to furazolidone and streptomycin. The other samples were found negative for any enteropathogens.

Q.No.1.5. What are the possible reasons for 44 of 59 samples being found negative for enteropathogens?

Q.No.1.6. Assume yourself as the team leader for the investigation of this outbreak. (i) How will you plan the investigations? (ii) How will you control the outbreak?

Exercise 2

During the period from 18 May to 19 June, 1991, 392 cases of clinically suspected typhoid fever were treated at the outpatient department of PHC Galore, district Hamirpur, Himachal Pradesh. Of them, 101 were admitted in the PHC. Analysis of the data on clinical features in the admitted patients revealed that they initially presented with fever (100%), headache (74%), pain abdomen (18%), vomiting (17%), diarrhoea (15%), constipation (7%), palpable spleen (57%) and palpable liver (13%). *Salmonella typhi* was isolated in 10 of 25 blood samples examined in the laboratories of Medical College, Shimla.

Q.No.2.1. What makes this an outbreak of typhoid fever? Comparable data from previous years are not available?

Q.No.2.2. If you want to organize a survey (using paramedical health worker/medical officers) for active search of cases, what case definition will you use?

A line list of admitted cases was available in the primary health centre, Galore. It provided information on name, age, sex, address and date of onset of symptoms for all the 101 cases.

Q.No.2.3. How will you analyze the data? Prepare dummy graphs and tables.

Table 2.1 provides you data on admitted cases by date of onset of symptoms.

Table 2.1
Weekly distribution of admitted cases by week of onset of symptoms

Week ending	No. of Cases
12.05.1991	0
18.05.1991	4
25.05.1991	16
01.06.1991	41
08.06.1991	25
15.06.1991	12
upto 19.06.1991	3
Total	101

Q.No.2.4. Prepare epidemic curve using data given in Table 2.1

Q.No.2.5. What type of epidemic curve have you got? How do you interpret this epidemic curve?

Tables 2.2 and 2.3 describe the cases by age, sex and village.

Table 2.2
Cases of typhoid fever by age and sex, PHC Galore

Age (years)	Male	Female	Total
0-1	0	0	0
2-5	2	8	10
6-15	25	10	35
16-25	18	17	35
26-35	2	5	7
36-50	5	4	9
50 +	0	5	5
All ages	52	49	101

Table 2.3
Cases of typhoid fever by sex and village, PHC Galore

Village	Male	Female	Total
Lanjiana	22	31	53
Daswin	17	1	18
Pahal	1	2	3
Halti	2	3	5
Ghirmani	4	0	4
5 other villages	6	12	18
Total	52	49	101

Q.No.2.6 Using the data available in tables 2.2 and 2.3, can you suggest a hypothesis for transmission of infection?

A marriage function was held in village Lanjiana on 16th May, 1991. The bridegroom belonged to village Daswin. Only males accompanied the marriage party, whereas persons of both sexes participated from bride's side. During this function, water was used from a *Bawri* (a local water body). Analysis of water from Bawri revealed very high contamination; coliform count 1600/100 ml, faecal coli 275/100 ml of water. Those who attended the function started becoming ill after about 2 weeks. Contaminated water from Bawri was suspected as the cause of this outbreak.

Q.No.2.7 Can you provide some alternative explanation for the transmission of infection during the marriage function?

Exercise 3

Almost all the outbreaks of viral hepatitis in India are due to faeco-orally transmitted hepatitis E. These outbreaks have been invariably linked to contaminated water supply. An occasional outbreak may be due to hepatitis A. Recently, a few outbreaks of hepatitis B epidemiologically linked to unsafe injections have also been reported. This exercise pertains to an outbreak of hepatitis E.

Residents of a locality in North West Delhi (SD Block, Pitampura : population 1435) felt an unusual increase in the cases of jaundice in April, 1994. The block was inhabited by people belonging to middle or upper socio-economic strata. All the residents had access to and used only sanitary latrine. The Block had piped water supply. There was no other source of water. The water supply was intermittent and did not fulfill the requirements of people. The residents therefore, used on-line-booster pumps to lift the water to their overhead tanks.

Q.No.3.1. How will you plan your investigation to (i) diagnose the disease and (ii) select a suitable case definition (for health worker) to assess the extent of outbreak?

Q.No.3.2. A house to house survey revealed 27 cases of jaundice in 1435 population within a reference period of 3 months. The attack rate of jaundice was found to be 1.9 percent. Many outbreaks are on record where a varying number of cases of jaundice (a few cases to many thousands) occurred in a short period. 27 cases in SD Block were also considered an outbreak. On what ground you could have reached to this conclusion?

Q.No.3.3. You found that most of the cases were due to hepatitis E (laboratory findings). You suspect contaminated piped water as the major factor in this outbreak. How will you substantiate your suspicion?

Q.No.3.4. If you are dealing with an unusual clustering of hepatitis B cases, how would you have plan to find out the mode of transmission?

Q.No.3.5. The outbreak in SD Block was due to hepatitis E. Using the data already provided to you, can you speculate (i) why did the outbreak occur at all? (ii) why was the outbreak not explosive?

Exercise 4

A patient from village Banyani (population 3403) came to the OPD of PHC on 7.10.1991 with complaints of fever, headache, bodyaches and chills. He also informed the medical officer about a large number of cases having similar illness in the village, of whom many had died.

Q.No.4.1. If you happened to be the incharge of PHC, what steps will you take and why?

A team of doctors from the PHC surveyed the village on 8.10.1991. They examined 756 persons. 696 (92%) of them were presently suffering from fever usually accompanied with rigors and chills. None of them had signs of meningitis. A medical specialist examined 63 patients of fever. 25 of them (40%) had spleen enlargement.

Q.No.4.2. Will you consider this episode as an outbreak of febrile illness? Do you need more information to reach at some conclusion?

Q.No.4.3. What was the most probable cause of this outbreak?

During the survey undertaken on 8.10.1991, 466 blood slides were collected from fever cases. 81 slides were found positive for malarial parasite (*Plasmodium vivax* 66, *Plasmodium falciparum* 15). The PHC considered it an outbreak of falciparum malaria. District authorities were informed about the outbreak and a treatment centre was established at village Banyani to treat the patients.

The state health authorities informed the National Institute . of Communicable Diseases on 1.11.91 about the outbreak. The message stated that a large number of fever cases and 21 deaths had occurred in a village in district Farukhabad.

Q.No.4.4. You do not have access to any other information except this message. Will you include JE and/or dengue fever in differential diagnosis? If yes, Why? If not, why?

NICD team visited the affected area during 1-3 November 1991. The team collected the following data from the PHC.

(i) 2294 blood slides were collected in village Banyani upto 2.11.91. 325 were found positive for malarial parasite (*P.falciparum* 131, *P.vivax* 194). About 40% of the positive slides were due to *P.falciparum*.

(ii) During the same period, 2184 slides were collected from other villages of PHC within 5 kilometer of village Banyani. 208 were found positive for malarial parasite (*P.falciparum* 36, *P.vivax* 172).

(iii) Malaria situation in PHC in the last five years is shown in Table 4.1.

Table 4.1
Malaria situation in PHC Talgram, 1987-1991

Year	Slides collected	Slides positive for MP		
		P.vivax	*P.falciparum*	Total
1987	3170	9	0	9
1988	5921	7	0	7
1989	5822	4	0	4
1990	7384	2	0	2
1991 (upto September)	7233*	2	0	2

* 948 slides still to be examined.
Note:- Population of the PHC about 2 lakhs.

(iv) 19 persons died due to suspected malaria; 3 in August, 12 in September and 4 in October.

Q.No.4.5 Why was this outbreak not detected in the early rising phase?

While going through the streets in village Banyani, it was observed that a large number of residents were rolling *bidies* (local cigarette) in front of their houses. On inquiry, it was found that *bidi* rolling and agriculture were the main occupations in village Banyani and a few surrounding villages. It provided the clue to the genesis of the outbreak in the village Banyani.

Q.No.4.6. Can you speculate on the genesis of outbreak of falciparum malaria in village Banyani? It is noteworthy that District Farukhabad did not report any case of falciparum malaria in the last 3 years.

Q.No.4.7. You have been given the responsibility to investigate and control this outbreak. How will you plan further investigations?

(Note:- See a related exercise in Module on Disease Surveillance)

CHECK LIST FOR MODEL DISTRICT LEVEL LABORATORY FOR DISEASE SURVEILLANCE

1. The laboratory should be able to perform following:

Microscopy: Rapid presumptive diagnosis of		Cholera Tuberculosis Diphtheria Plague Malaria Filariasis Meningitis
Bacteriological culture of		Stool, especially for cholera
Bacteriological examination of		Water for coliform count
Rapid diagnostics for		AIDS Meningitis due to *meningococci, pneumococci* or *H.influenzae* HBsAg (also for volunteer donors) Syphilis
Non-ELISA based tests		Typhoid fever

2. Laboratory should be equipped to collect, store and transport specimens for following:

Stool, blood/serum, CSF
milk/food
Vomitus
For various diseases including arboviral diseases such as JE and dengue fever, poliomyelitis, and measles
Samples from environment such as soil

3. Laboratory should have the facilities to wash and sterilize glassware etc. needed for collection and transportation of clinical and environmental specimens as well as for separating serum from blood samples.

4. Laboratory should have adequate inventory/or access to basic material that may be needed for surveillance and investigation of outbreak or to provide support in times of disasters.

5. Standard operating procedural manual should be available with the laboratory.

6. Adequate staff members who are qualified and/or oriented/trained for undertaking disease surveillance work.

7. Sufficient stationery for maintaining the records and dispatching the same to other centers.

8. Laboratory should have access to electronic communication network for rapid transmission of results and/or early warning signals.

CHECK LIST
FOR DISTRICT LABORATORY FOR DISEASE SURVEILLANCE

S.No.	Activity	Yes/No
1.	**Does the lab undertake microscopic examination for**	
	Stool sample for cholera bacilli	
	Sputum for tuberculosis bacilli	
	Throat aspirate swab for diphtheria bacilli	
	Bubo aspirate/sputum for plague bacilli	
	Peripheral blood smear for malarial parasite	
	Peripheral blood smear for microfilariae	
	CSF for meningitis organisms	
2.	**Does the lab undertake bacteriological examination of**	
	Faeces for cholera bacilli	
	Water samples for coliform count	
3.	**Does the lab have rapid diagnostic kits for**	
	HIV infection	
	Meningitis	
	Syphilis	
	Australia antigen (HBsAg)	
4.	**Are following equipment available in functional condition in lab**	
	Autoclave	
	Microscope	
	Centrifuge	
	Refrigerator	
	Deep freezer (-20c)	
	Balance	
	pH meter	
	Gas meter	
	Incubator	
	Water bath	
	Hot air oven	
5.	**Does lab perform serological tests**	
	VDRL	
	Widal	
	ASO	
	Any other	
6.	**Does lab has full time professionals**	
	Microbiologist/Medical Officer trained in microbiology	
	Technical staff with qualification in lab medicine	
	1.	
	2.	
	3.	
	Supportive staff with experience in lab	
	1.	
	2.	
	3.	

7.	**Does the lab has at any point of time followings**	
	1. 100 sterile glass syringes with needles	
	2. 100 screw capped glass vials for blood collection	
	3. 100 screw capped plastic vials for storage of serum	
	4. 100 plastic/glass petri dishes	
	5. Cary Blair transport medium (50 vials)	
	6. 10 pairs of Gloves	
	7.	
8.	**Are SOPMs available with the lab**	
9.	**Does the lab has an access to NICNET/ERNET**	
10.	**Does the lab has a system of record storing which is:**	
	Manual	
	Computerized	
11.	**Is there any periodic evaluation of working of lab**	
12.	**Is there a stand-by supply of electricity**	
	If yes, what are the equipment which are on it:	
13.	**Does the lab has an inventory of regional and national reference labs where samples can be sent:**	
14.	**Does the lab participate in any external quality assurance scheme in bacteriology/serology?**	

INTER-DEPARTMENTAL COMMITTEE
SUGGESTED AREAS OF RESPONSIBILITY AND ACTION

District administration/Zila Panchayat

- mobilize resources by organizing meetings with
  - concerned government departments
  - non-governmental agencies
  - community leaders
- ensure adequate quality monitoring of water samples
- repair of leakage in water pipe lines
- arrange safe water supply
- ensure supplies of ORS packets and other essential items
- ensure vector control measures
- ensure adequate facilities for transportation of serious patients to district hospital, if necessary
- strengthening of existing provision under the Drug & Cosmatic Act to curtail over the counter sale of parenteral drugs
- provide relevant information to the press
- monitor status of control activities

District Health Office / Municipal Health Office

- arrange repair of leakage in water pipe lines
- alert health personnel to report cases and to monitor trends
- arrange active surveillance in affected area
- ensure that treatment guidelines are followed in hospitals and other health facilities
- ensure availability of ORS packets and other essential items
- strengthening of existing provision under the Drug & Cosmatic Act to curtail over the counter sale of parenteral drugs
- ensure vector control measures
- arrange health educational camps and distribution of health educational material
- arrange chlorination of water sources if possible
- arrange water quality monitoring
- convene meeting under district administrator to seek cooperation of other government departments and NGOs
- check sterilization practices of medical practitioners for syringes, needles and sharp instruments

Concerned Department (s) responsible for water supply

- repair of leakage in water pipe lines
- arrange potable water supply, including water tankers if necessary
- arrange chlorination of water
- ensure water quality monitoring

Other government departments such as social welfare, education, tribal welfare and NGOs

- dissemination of relevant information
- promotion of oral rehydration therapy
- ensure vector control measures
- check sterilization practices of medical practitioners
- reporting of cases

Panchayat members, village pradhans, community leaders

- dissemination of relevant information
- promotion of oral rehydration therapy
- ensure vector control measures
- check sterilization practices of medical practitioners
- reporting of cases
- monitoring chlorination of water sources such as wells
- arranging transportation of serious cases to hospital

Annex-3

SUGGESTED FORMAT FOR LINE LIST OF CASES

Sl. No.	Name of Patient	Father's/ Husband's Name	Address	Age	Sex	Date of Onset of symptoms	Symptoms	Outcome of illness (still ill/ died / recovered)	Remarks

Note:- A column on immunization status should be added for vaccine preventable diseases.

FORMAT FOR OUTBREAK INVESTIGATION REPORT

General Information

State :_____
District :_____
Town/PHC :_____
Ward/Village :_____
Population :_____

Background Information

Person reporting the outbreak :_____
Date of report :_____
Date investigations started :_____
Person(s) investigating the outbreak _____

Details of Investigation

Describe how the cases were found (may include: (a) house-to-house searches in the affected area; (b) visiting blocks adjacent to the affected households; (c) conducting record reviews at local hospitals; (d) requesting health workers to report similar cases in their areas, etc.):

_____
_____
_____
_____
_____

Descriptive Epidemiology

11. Cases by time, place and person (attach summary tables and relevant graphs and maps).
12. Age-specific attack rates and mortality rates
13. High-risk age-groups and geographical areas.

Description of Control Measures taken

_____

Description of Measures for Follow-up Visits:

_____
_____
_____

Brief Description of Problems encountered

_____

_____

_____

Factors which, in your opinion, contributed to the Outbreak

_____

_____

_____

Conclusions and Recommendations

-

_____

_____

_____

Date (Name and Designation)

Note: This report should be submitted by the investigating officer (State/District/PHC Nodal Officer) to the next higher authority within a week of completion of investigation. Tables and Graphs should be included wherever appropriate.

प्रबन्धक, भारत सरकार मुद्रणालय, फरीदाबाद द्वारा मुद्रित, 1998

PRINTED BY THE MANAGER, GOVERNMENT OF INDIA PRESS, FARIDABAD 1998